Extending the "Deep Blue" aerosol record from SeaWiFS and MODIS to NPP-VIIRS

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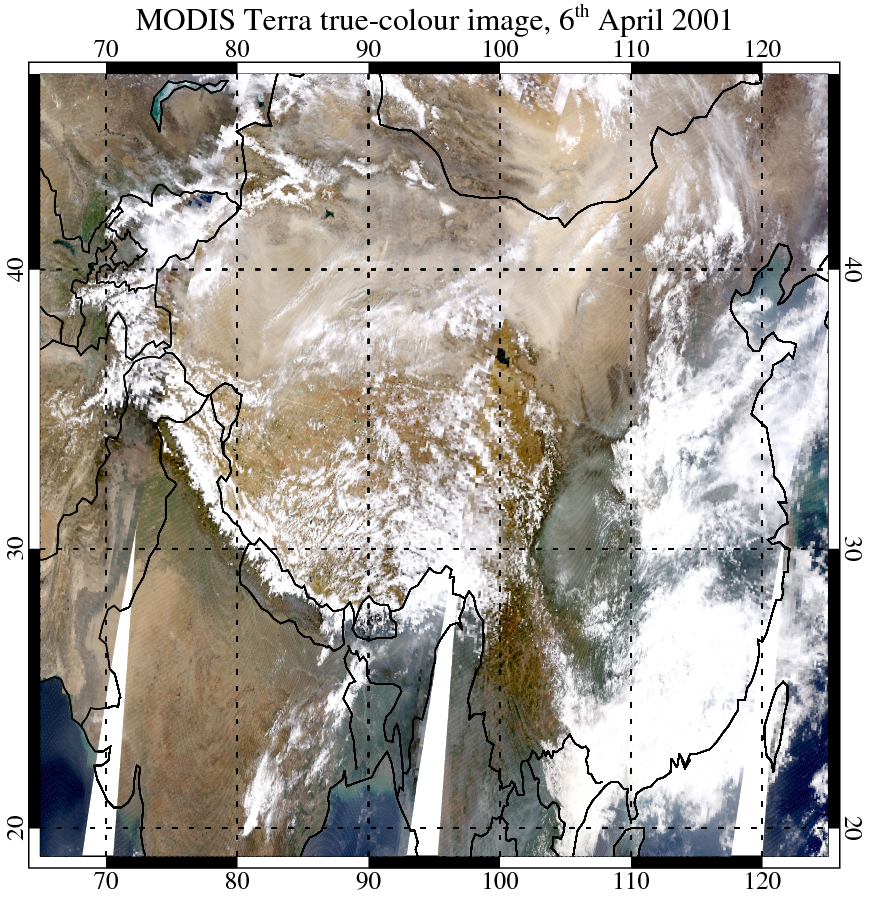
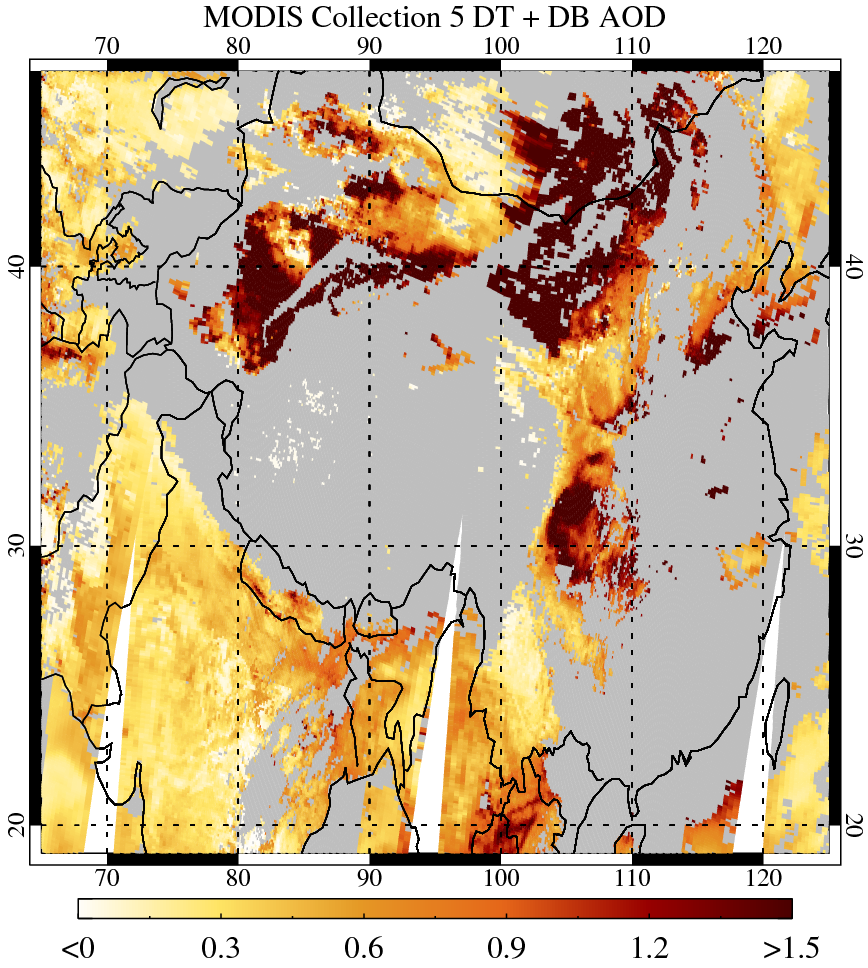
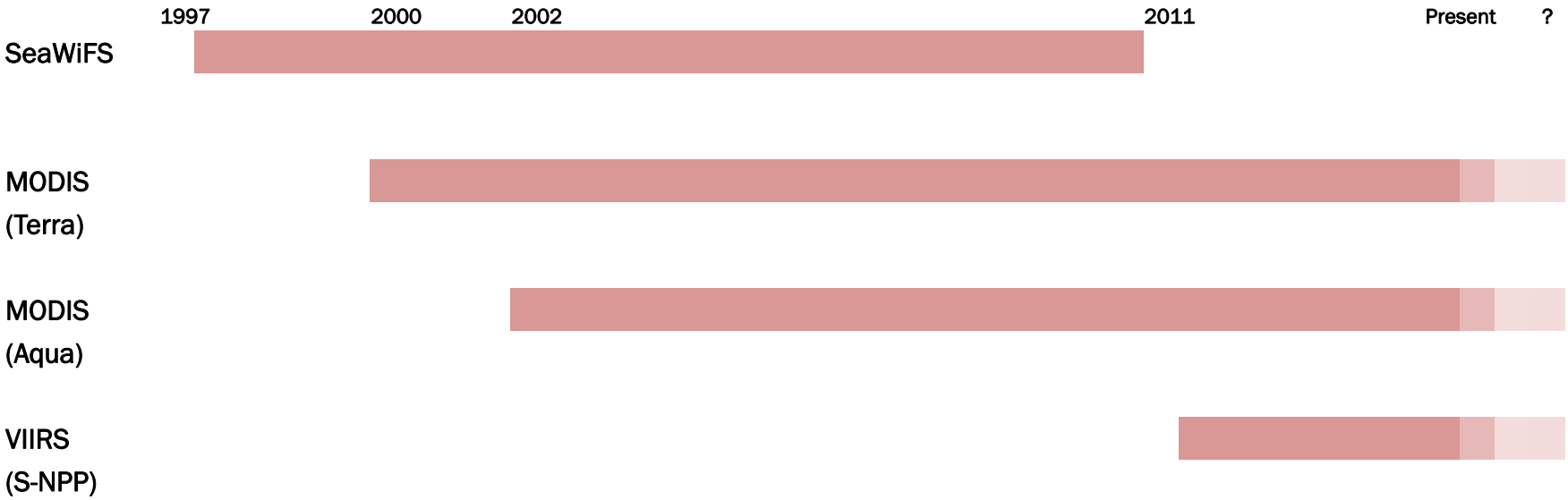
Deep Blue expands AOD coverage to deserts and other bright surfaces





Using multiple similar satellite sensors enables us to obtain a long data record



The Deep Blue family consists of three separate aerosol optical depth (AOD) retrieval algorithms

Bright land

Surface reflectance database, BRDF correction

AOD retrieved separately at each of 412, 470/490, (650) nm

SSA retrieved for heavy dust events

Dark land

Spectral/directional surface reflectance relationship

AOD retrieved separately at 470/490 and 650 nm

Water

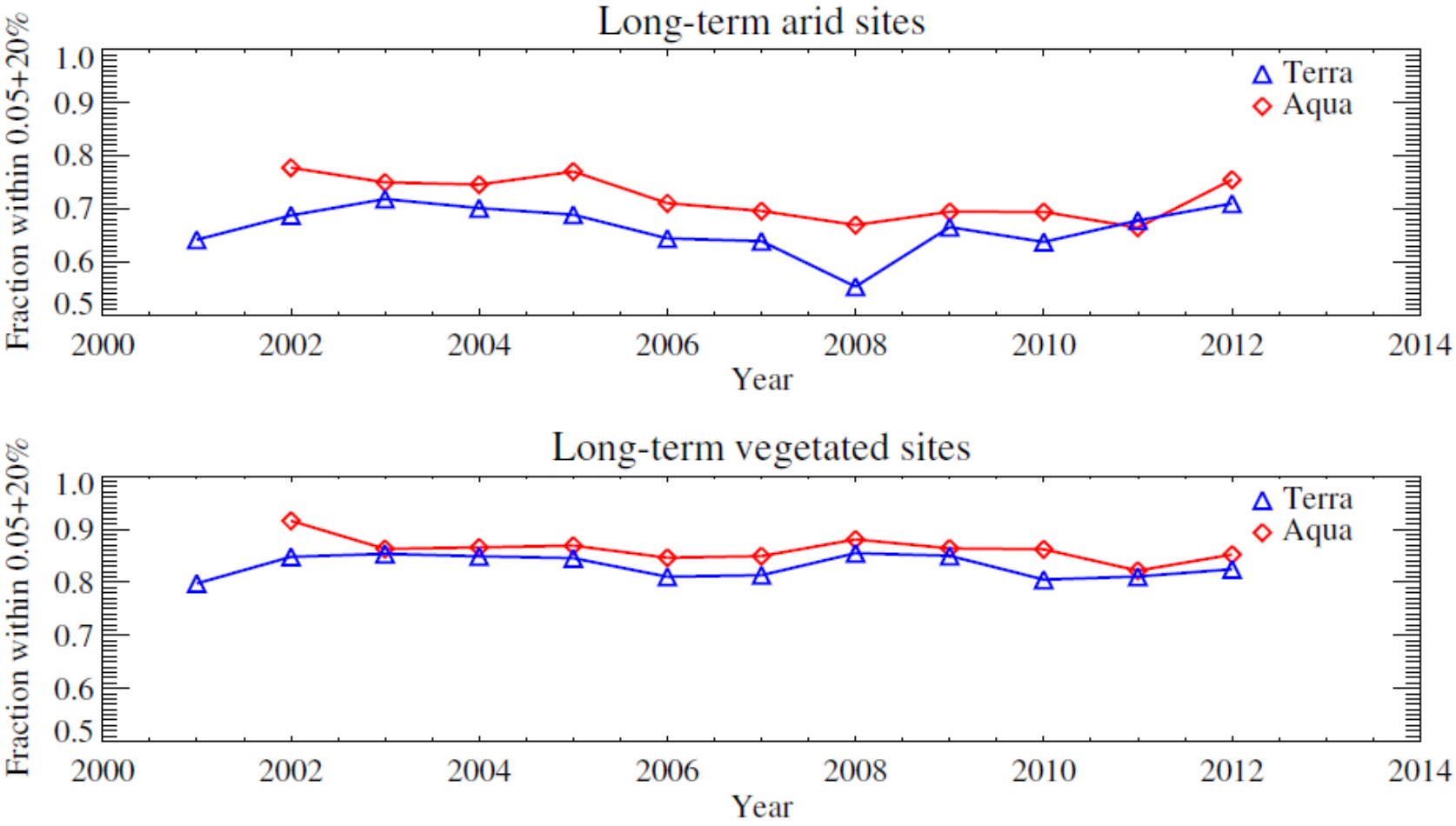
Surface BRDF including glint, foam, underlight

Multispectral inversion

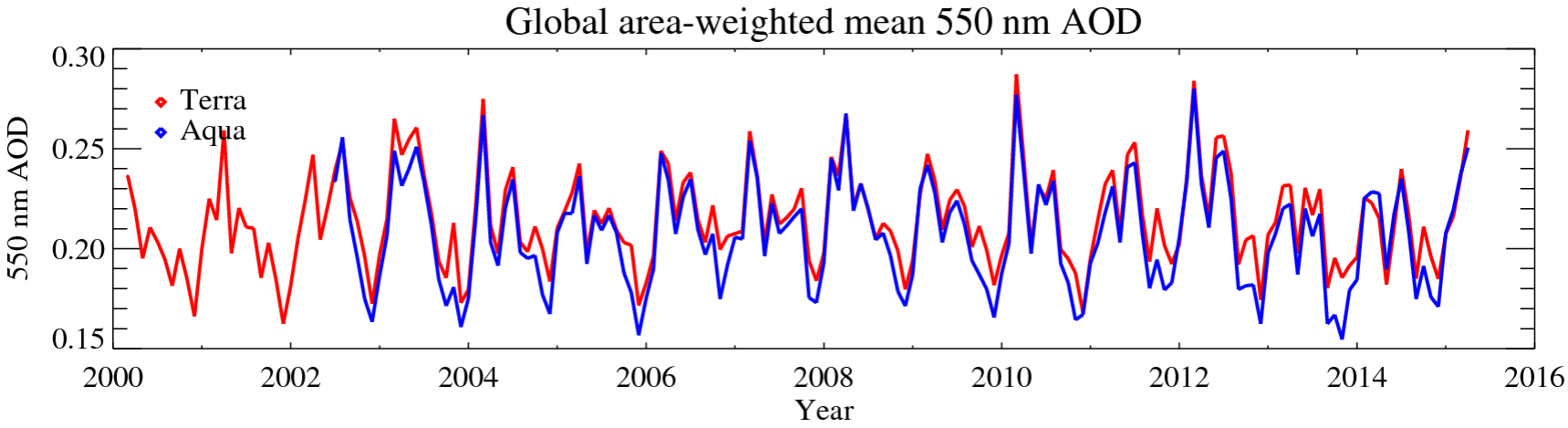
(Not present in MODIS dataset)

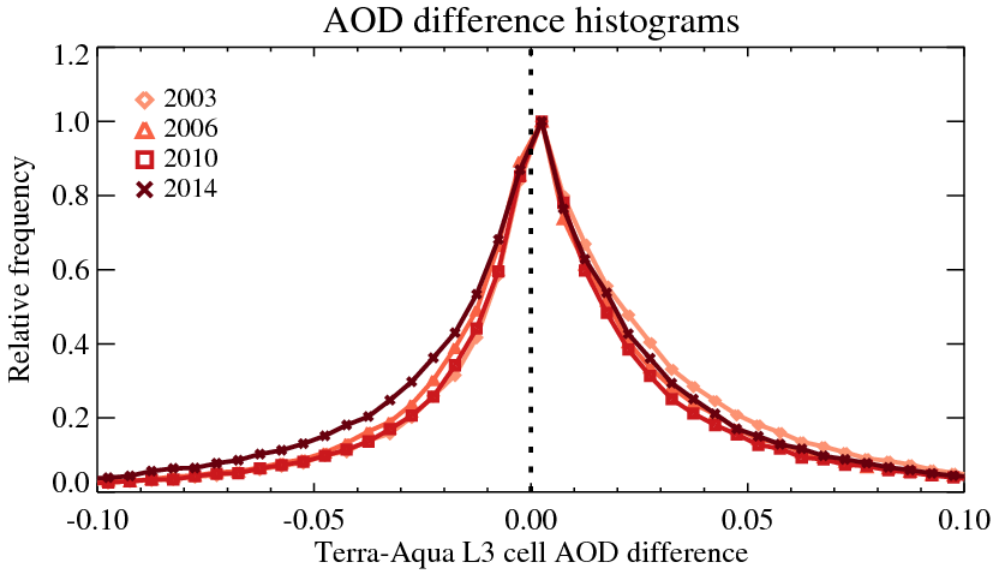
All report the AOD at 550 nm, and Ångström exponent (AE)

MODIS Collection 6 data for Terra and Aqua are now both available, and show good long-term stability

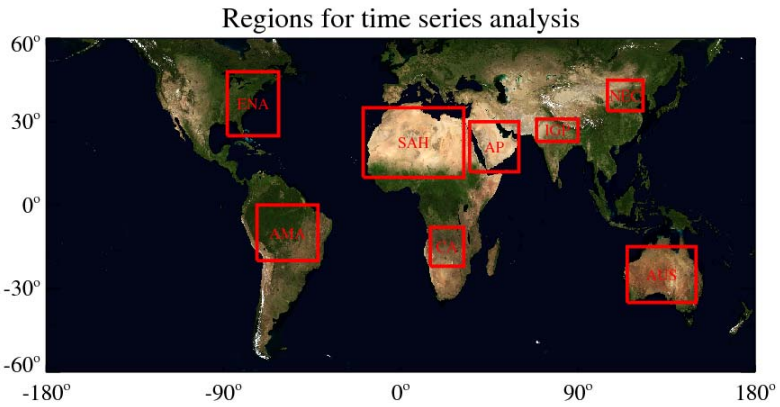


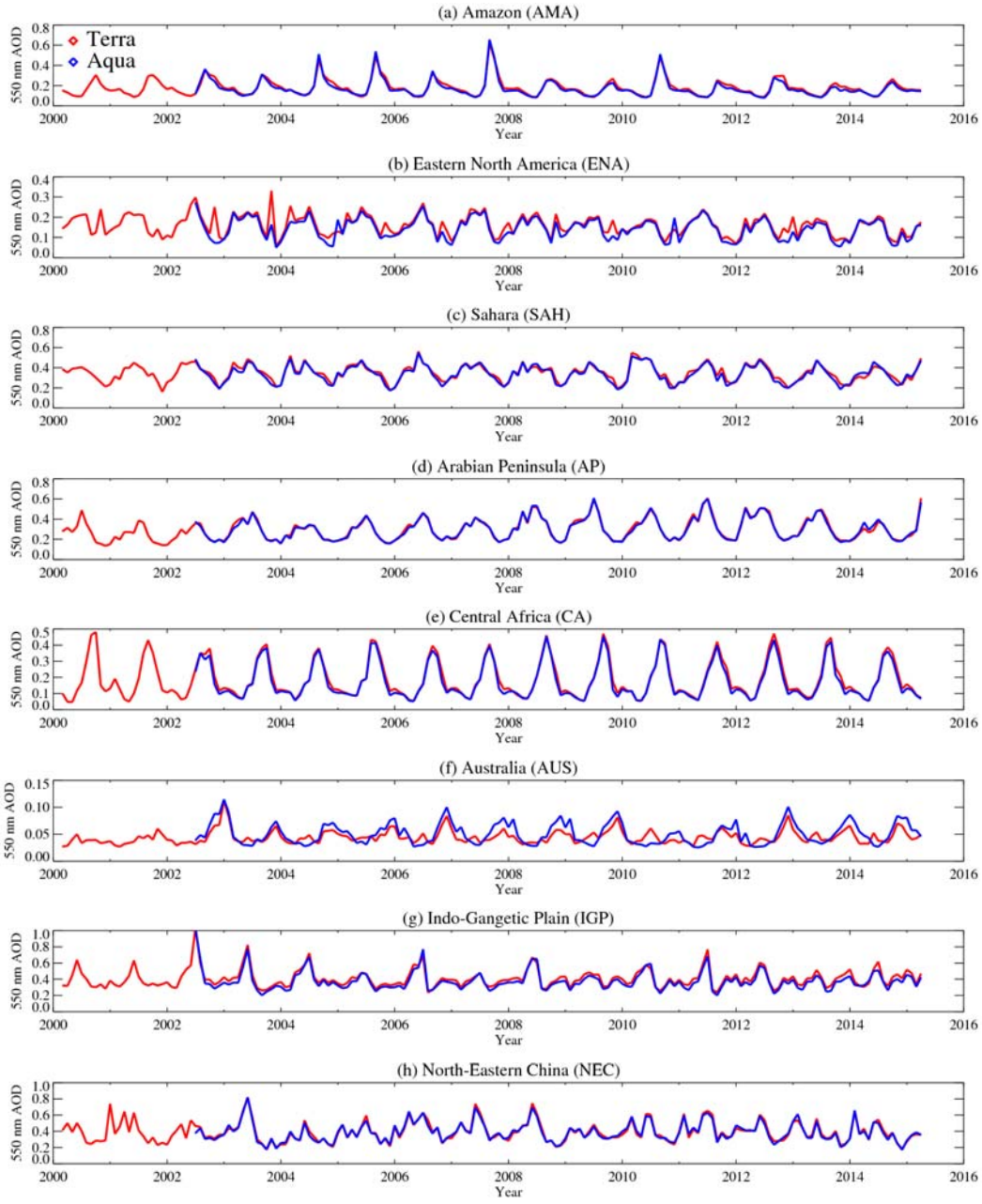
Terra/Aqua time series track each other closely; Terra has a fairly consistent high AOD offset ~0.005





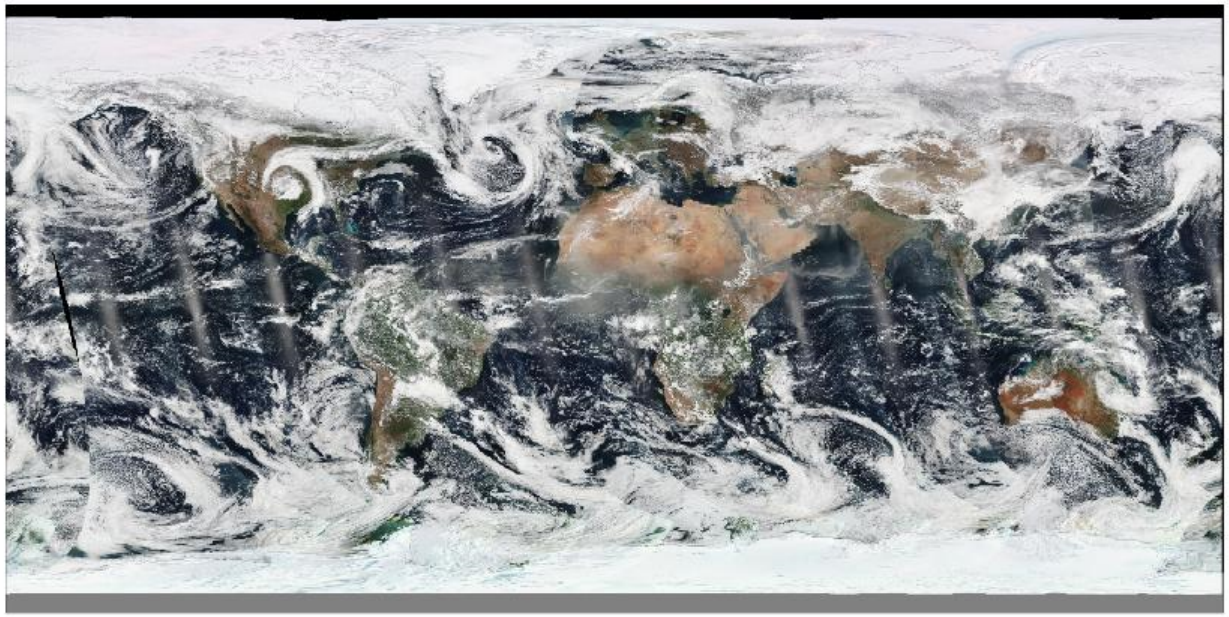
Regionally, the two sensors show consistent seasonal and interannual variability





The Visible Infrared Imaging Radiometer Suite (VIIRS) was launched on S-NPP at the end of 2011, and is similar* to SeaWiFS and MODIS

- Spectral range 412 nm – 12 μm
- Swath width ~3000 km
- M-band resolution ~0.75 km



VIIRS RGB (True Color) 2012-03-22

R : M05 (0.672 μm); G : M04 (0.555 μm); B : M03 (0.488 μm)

Image courtesy Wisconsin Atmospheres PEATE/SIPS

*for our purposes

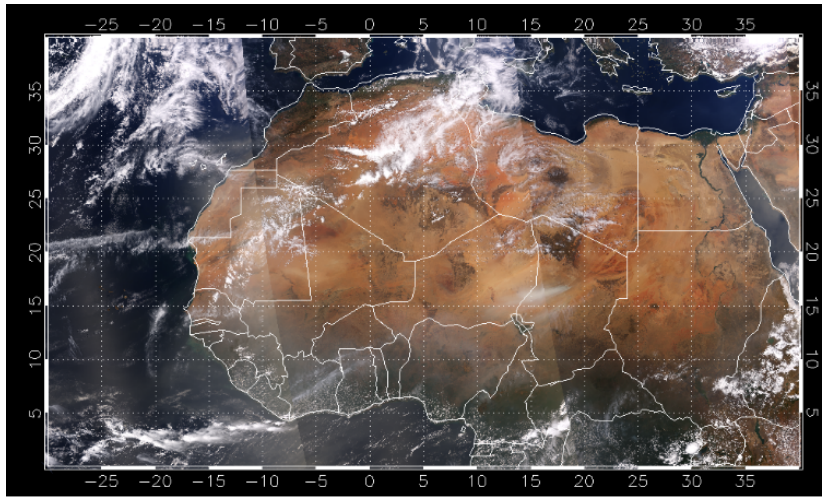
VIIRS Deep Blue will extend and improve on MODIS heritage products

- Spatial resolution 6 km
  - Reduced scan-edge pixel growth compared to MODIS
- Pixel-level AOD uncertainty estimates (eventually)
- Pixel-level quality assurance (QA) flags
  - Files will include additional QA-filtered datasets
- Levels 2 (swath-level) and 3 (daily/monthly aggregate) products
- Full mission (re)processing(s) with consistent algorithm and calibration

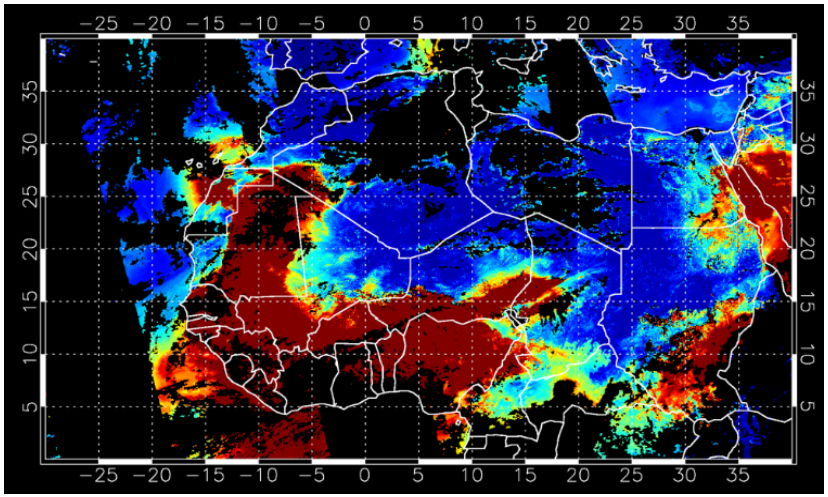
Fires in Africa: 10-12 °S, 21-23 °E
MODIS Aqua, June 1 2006, 12:05 UTC

NASA VIIRS Deep Blue covers more surface types than NOAA VIIRS, without the inter-orbit gaps of MODIS

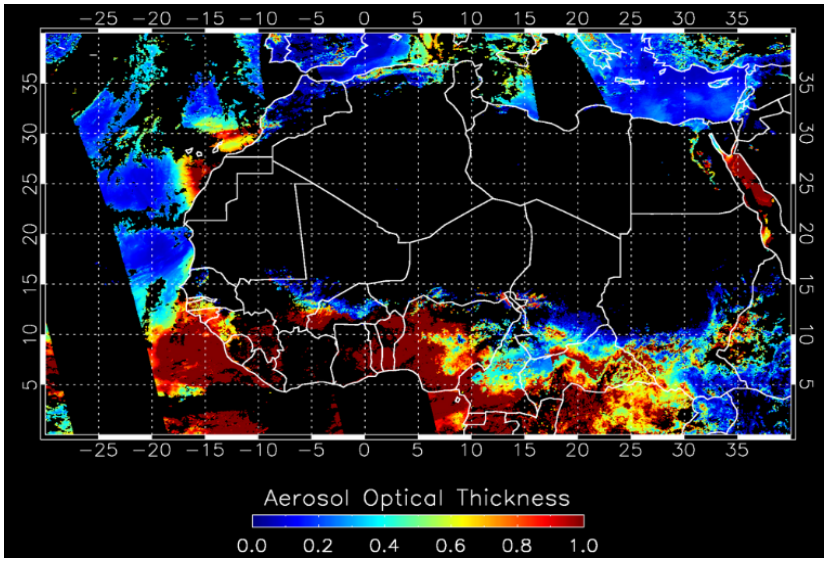
S-NPP/VIIRS RGB March 22, 2012



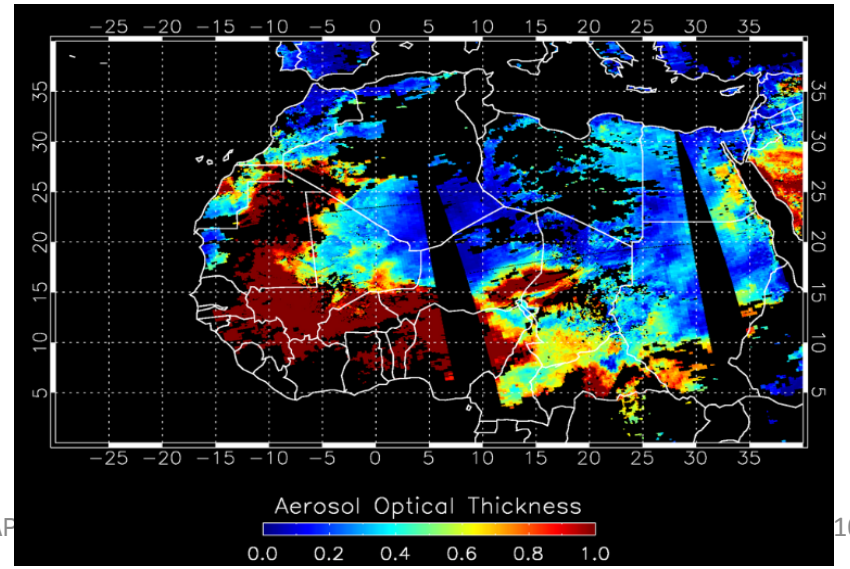
VIIRS Deep Blue AOD



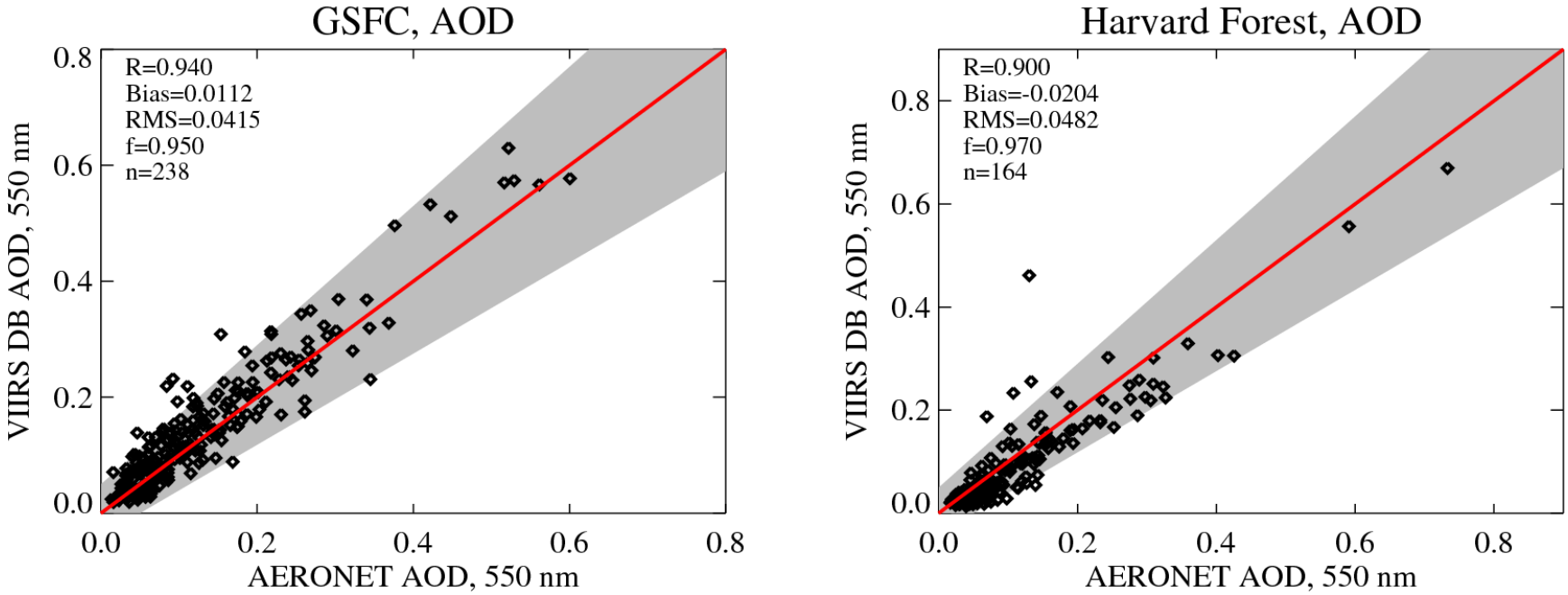
NOAA VIIRS (IDPS) AOD



MODIS C6 AOD



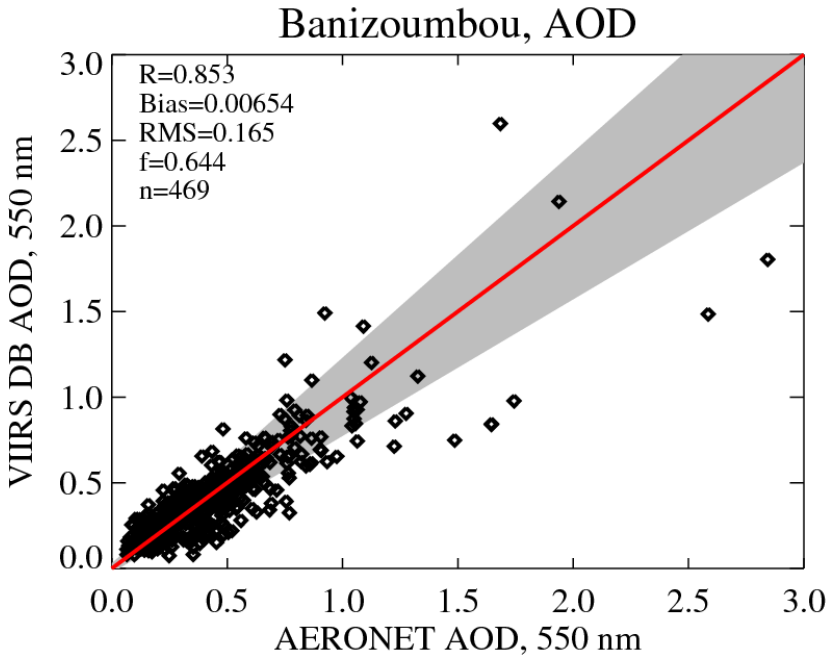
Retrieval quality seems comparable to MODIS…
… over vegetated/suburban land

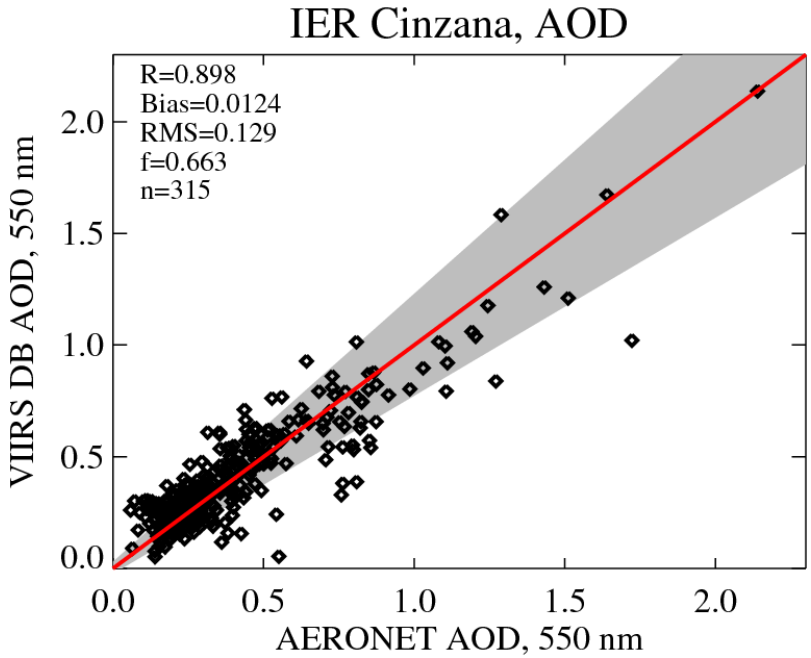


- Shaded ‘expected error’ confidence interval of ±(0.05+20%)

Retrieval quality seems comparable to MODIS…

… over arid land

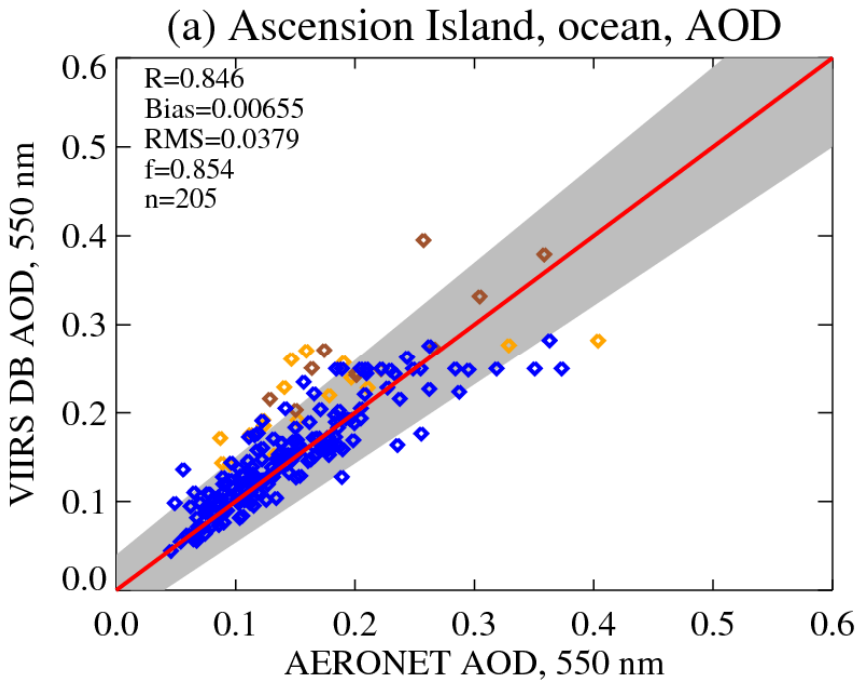


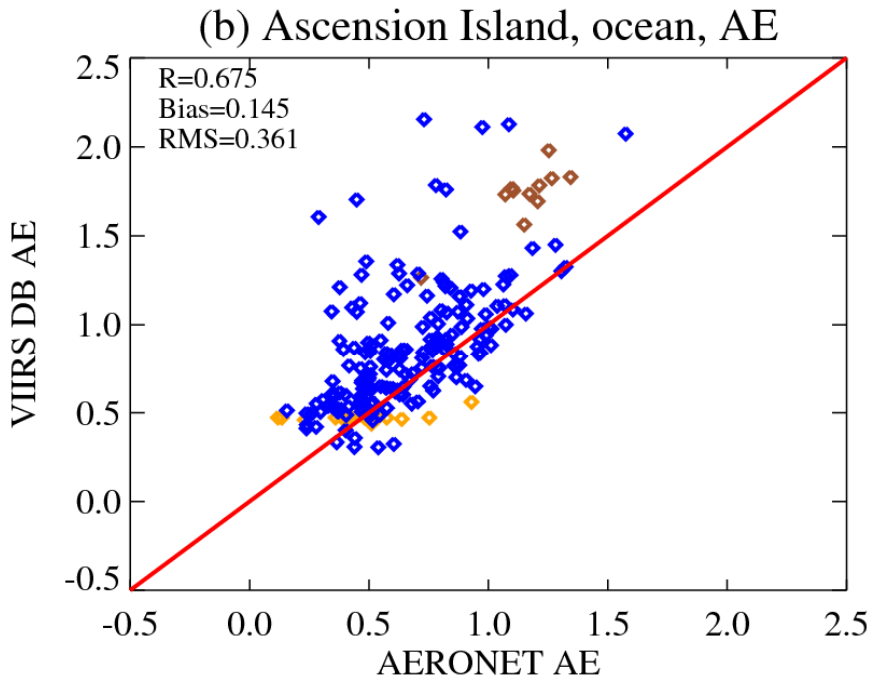


- Shaded ‘expected error’ confidence interval of ±(0.05+20%)

Retrieval quality seems comparable to MODIS…

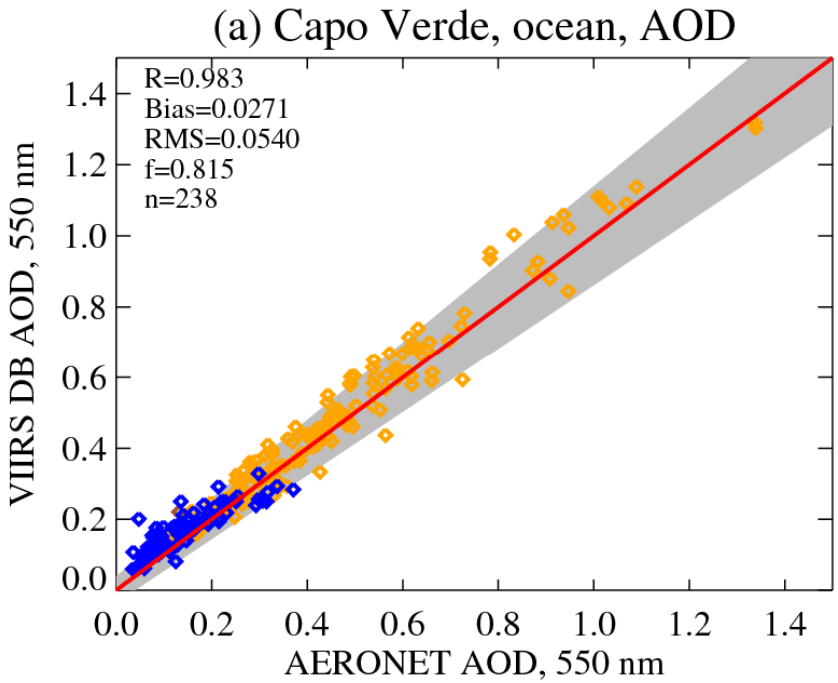
… over water

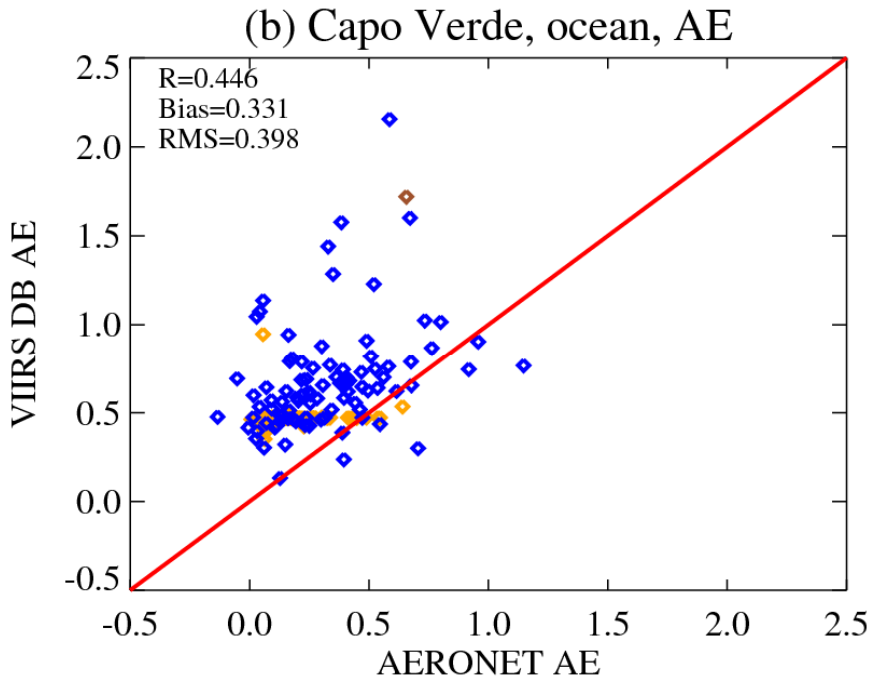




- Shaded ‘expected error’ confidence interval of ±(0.04+10%)
- Colours indicate aerosol optical model (retrieved, not prescribed): maritime, dust, fine-mode dominated

Retrieval quality seems comparable to MODIS…
… over water





- Shaded ‘expected error’ confidence interval of ±(0.04+10%)
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We like hearing from data users

- Centralised Deep Blue website coming soon! Meanwhile:
  - SeaWiFS version 4 – http://disc.gsfc.nasa.gov
  - MODIS Collection 6 – http://modis-atmos.gsfc.nasa.gov/
  - VIIRS first release later this year
    - Will be archived at http://ladsweb.nascom.nasa.gov/data/, alongside MODIS data
    - Near real-time (NRT) data will also be available via LANCE: https://earthdata.nasa.gov/data/near-real-time-data

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